

Planning/
Policy/
System
Information

NOVEMBER 2014

Project Title:

Developing a Model to Quantify
Emissions from Heavy-Duty
Construction Equipment

Task Number: 2330

Start Date: March 1, 2012

Completion Date: April 30, 2014

Product Category: New decision support
tool and model; improved technical
standard, plan, or specification

Task Manager:

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Quantifying Construction Equipment Emissions

*New emissions model provides more thorough information to
address regulations*

WHAT WAS THE NEED?

Gaseous and particulate emissions from construction engines are an important portion of California's total air pollutants and are gaining increasing regulatory attention. It is necessary to quantify nitrogen oxides and particulate matter to inventory the contribution of construction equipment, such as used by Caltrans, to atmospheric loadings, particularly for those projects in maintenance areas or where air pollution levels consistently exceed the national ambient air quality standards.

Part of the justification for air emissions regulations in California is based on California Air Resources Board (CARB) estimates of emissions from construction equipment. Regulations requiring retrofitting or replacing older equipment to reduce emissions had been enacted, but were on hold. In response, Caltrans determined the need to develop an emissions model to

quantify off-road fleet emissions at a regional level and at specific job sites. Since completion of the task, the regulations were amended to include performance requirements and remove mandated retrofitting, but letting it remain as a compliance option if an agency decides it is a less expensive option. As a result, the hold has been lifted. Through the model's analysis capability, Caltrans can better estimate the emissions factors of its construction practices, evaluate equipment options, and ensure compliance with CARB regulations.



WHAT WAS THE GOAL?

The goal was to quantify certain air pollutants that occur during the use of heavy-duty construction equipment activity.

WHAT DID WE DO?

Caltrans, in partnership with the University of California, Riverside Center for Environmental Research & Technology, measured the emissions, fuel economy, and activity of various off-road construction equipment under normal operations in the field. The researchers collected the portable emission measurement system (PEMS) and portable activity measurement system (PAMS) data to develop an Excel model that helps determine the correlations between the measured emissions and the engine operation parameters. These correlations formed the basis of the emissions model.

WHAT WAS THE OUTCOME?

The researchers developed an Excel-based model to estimate the off-road emissions of the major pieces of construction equipment employed in Caltrans projects. As emissions and activity data become available for additional equipment types, the Excel model can be modified to expand its applicability and provide a more formal basis for regulatory development.



WHAT IS THE BENEFIT?

Prior to this effort, no model was mutually accepted by Caltrans and the regulatory agencies to use for estimating construction emissions or developing appropriate regulations, due in part to a lack of emissions data from construction equipment under in-use operating conditions. Not having substantiated data and a scientific basis for regulation has resulted in legal cases and other obstacles that could potentially delay or inhibit important transportation projects. Establishing regulations based on sound science enhances the environmental process associated with implementing new construction projects.

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To view the complete report:
www.dot.ca.gov/research/researchreports/reports/2014/final_report_task_2330.pdf

